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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/070,549

03/07/2002

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L9289.02141

4647

24257 7590 12/29/2006
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EXAMINER

TORRES, JUAN A

ART UNIT

PAPER NUMBER

2611

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

12/29/2006

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/070,549

Applicant(s)

SUMASU ET AL.

Examiner

Juan A. Torres

Art Unit

2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 March 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-56 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 16-55 is/are rejected.
- 7) ☒ Claim(s) 15 and 56 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 March 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Priority

Applicant is advised of possible benefits under 35 U.S.C. 119(a)-(d), wherein an application for patent filed in the United States may be entitled to the benefit of the filing date of a prior application filed in a foreign country.

Drawings

The drawings are objected to because:

a) Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated (see page 1 lines 27-28 of the description). See MPEP § 608.02(g).

b) The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "152" and "103" have both been used to designate mapping section (see figure 2).

c) The recitation in figure 5 "PRE-CONVERSION OFDM SYMBOL PTTERN" is improper because it is not properly constructed; it is suggested to be changed to "PRE-CONVERSION OFDM SYMBOL PATTERN" (emphasis added).

d) The recitation in figure 5 "POST-CONVERSION OFDM SYMBOL PTTERN" is improper because it is not properly constructed; it is suggested to be changed to "POST-CONVERSION OFDM SYMBOL PATTERN".

e) The recitation in figure 7 "PRE-CONVERSION OFDM SYMBOL PTTERN" is improper because it is not properly constructed; it is suggested to be changed to "PRE-CONVERSION OFDM SYMBOL PATTERN".

f) The recitation in figure 7 "POST-COMVERSION OFDM SYMBOL PTTERN" is improper because it is not properly constructed; it is suggested to be changed to "POST-CONVERSION OFDM SYMBOL PATTERN".

g) The recitation in figure 10 "PATTERN COLLATION SECTION" in block 453 is improper (see specification page 25 lines 3 and 12, and page 26 lines 6 and 9); it is suggested to be changed to "PATTERN CONVERSION SECTION" (emphasis added).

h) The recitation in figure 13 "PRE-COMVERSION OFDM SYMBOL PTTERN" is improper because it is not properly constructed; it is suggested to be changed to "PRE-CONVERSION OFDM SYMBOL PATTERN".

i) The recitation in figure 13 "POST-COMVERSION OFDM SYMBOL PTTERN" is improper because it is not properly constructed; it is suggested to be changed to "POST-CONVERSION OFDM SYMBOL PATTERN".

j) The recitation in figure 14 "PRE-COMVERSION OFDM SYMBOL PTTERN" is improper because it is not properly constructed; it is suggested to be changed to "PRE-CONVERSION OFDM SYMBOL PATTERN".

k) The recitation in figure 14 "POST-COMVERSION OFDM SYMBOL PTTERN" is improper because it is not properly constructed; it is suggested to be changed to "POST-CONVERSION OFDM SYMBOL PATTERN".

l) The recitation in figure 18 "PRE-COMVERSION OFDM SYMBOL PTTERN" is improper because it is not properly constructed; it is suggested to be changed to "PRE-CONVERSION OFDM SYMBOL PATTERN".

m) The recitation in figure 18 "POST-CONVERSION OFDM SYMBOL PTTERN" is improper because it is not properly constructed; it is suggested to be changed to "POST-CONVERSION OFDM SYMBOL PATTERN".

n) The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: "604" in figure 21 (see description page 46 line14; page 47 lines 13 and 14; and page 49 line 25).

o) The recitation in figure 21 "(SPREADING CODE N)" seems to be improper (see figure 21 labeling of blocks 603-1 to 603-n and 614-1 to 614-n); it is suggested to be changed to "(SPREADING CODE n)" (emphasis added).

p) The recitation in figure 23 "(SPREADING CODE N)" seems to be improper (see figure 23 labeling of blocks 603-1 to 603-n and 614-1 to 614-n); it is suggested to be changed to "(SPREADING CODE n)" (emphasis added).

q) The recitation in figure 24 "(SPREADING CODE N)" seems to be improper (see figure 24 labeling of blocks 703-1 to 703-n and 712-1 to 712-n); it is suggested to be changed to "(SPREADING CODE n)" (emphasis added).

r) The recitation in figure 25 "(SPREADING CODE N)" seems to be improper (see figure 25 labeling of blocks 802-1 to 802-n and 812-1 to 812-n); it is suggested to be changed to "(SPREADING CODE n)" (emphasis added).

s) The recitation in figures 26B and 26C in the abscissa ordinate is not in English language; it is suggested to translate these recitations into English.

t) The recitation in figure 27 "(SPREADING CODE 21)" (blocks 901-1, 903-1, 911-1 and 913-1) seems to be improper (see figure 25 labeling of blocks 802-1 to 802-n and 812-1 to 812-n); it is suggested to be changed to "(SPREADING CODE 1)".

u) The recitation in figure 27 "(SPREADING CODE 22)" (blocks 901-2, 903-2, 911-2 and 913-2) seems to be improper (see figure 25 labeling of blocks 802-1 to 802-n and 812-1 to 812-n); it is suggested to be changed to "(SPREADING CODE 2)".

v) The recitation in figure 25 "(SPREADING CODE N)" (block 903-n and 911-n) seems to be improper (see figure 25 labeling of blocks 802-1 to 802-n and 812-1 to 812-n); it is suggested to be changed to "(SPREADING CODE n)" (emphasis added).

w) The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "channel estimating means for estimating channels using a known signal; replica signal generating means for generating a replica signal of a first symbol string mapped to subcarriers with the first symbol string including the first symbol using the result of said channel estimation; received symbol pattern deciding means for deciding a received symbol pattern by comparing said replica signal with the received symbol pattern; and demodulating means for obtaining reception data from the decided received symbol pattern" (see claim 15); "notifying means for notifying the number of subcarriers to which the first symbol is mapped" (see claim 22); "insertion position storing means for storing the position and timing of the first symbol in the first symbol string" (claim 28); "random number generating means for determining the position and timing of the first symbol in the first symbol string according to random numbers" (claim 29); and a transmitting step

of transmitting a known signal, and the receiver side further comprising: a receiving step of receiving said known signal; a channel estimating step of estimating channels using said received signal; a replica signal generating step of generating a replica signal with the first symbol string including the first symbol using the result of said channel estimation; a received symbol pattern deciding step of deciding a received symbol pattern by comparing said replica signal with the received symbol pattern; and a demodulating step of obtaining reception data from the decided received symbol pattern (claim 56) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The disclosure is objected to because of the following informalities:

a) The recitation in page 2 line 11 "BPSK (Binariphase Phase Shift Keying)" is improper because it is not properly constructed; it is suggested to be changed to "BPSK (Binary Phase Shift Keying)".

b) The recitation in page 32 line 28 "wit 3 values" is improper because it is not properly constructed; it is suggested to be changed to "with 3 values".

c) The recitation in page 41 line 21 "107" is improper (see figure 19); it is suggested to be changed to "507".

d) The recitation in page 43 line 15 "digital modulation section 510" is improper (see figure 19); it is suggested to be changed to "digital demodulation section 510".

e) The recitation in page 43 lines 16-17 "digital modulation section 510" is improper (see figure 19); it is suggested to be changed to "digital demodulation section 510".

f) The recitation in page 62 lines 5-11 "Demapping sections 615-1 to 615-n store information on the correspondence between the received symbol patterns and pre-conversion symbol patterns, convert the received symbol patterns output from P/S conversion sections 813-1 to 813-n to pre-conversion symbol patterns and output to digital demodulation sections 616-1 to 616-n" seems to be improper (see figure 27); it is suggested to be changed to "Demapping sections 615-1 to 615-n store information on

the correspondence between the received symbol patterns and pre-conversion symbol patterns, convert the received symbol patterns output from despreding sections 913-1 to 913-n to pre-conversion symbol patterns and output to digital demodulation sections 616-1 to 616-n" (emphasis added).

Appropriate correction is required.

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 2-7, 17-20, 41, 42, 44 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As per claim 2, claim 2 claims that "demapping means demaps a multi-carrier signal mapped to subcarriers with a first symbol string including a first symbol to a second symbol string excluding said first symbol in predetermined symbol units and demodulates the demapped symbol pattern to obtain reception data", and in the specification it is disclosed that the demapping means demaps, and the demodulating means demodulates, so it is vague and indefinite if the demapping means only demaps or demaps and demodulates.

As per claims 4, 6 and 7, they are rejected because they depend directly or indirectly from claim 2 and claim 2 is rejected.

As per claim 3, claim 3 claims that "the demapping means demodulates", and in the specification it is disclosed that the demapping means demaps, and the demodulating means demodulates, so it is vague and indefinite if the demapping means only demaps or demaps and demodulates.

As per claim 5, claim 5 is rejected because depends directly from claim 3 and claim 3 is rejected.

As per claim 17, claim 17 claims that "mapping means maps the second symbol string obtained by modulating data to be sent to subcarriers with the first symbol string including the first symbol", and in the specification it is disclosed that the mapping means maps, and the modulating means modulates, so it is vague and indefinite if the mapping means only maps or maps and demodulates.

As per claim 19, claim 19 is rejected because depends directly from claim 17 and claim 17 is rejected.

As per claim 18, claim 18 claims that "the mapping means converts second data expressed with two discrete values to be sent to first data expressed with three discrete values and modulates", and in the specification it is disclosed that the mapping means maps, and the modulating means modulates, so it is vague and indefinite if the mapping means only maps or maps and modulates.

As per claim 20, claim 20 is rejected because depends directly from claim 18 and claim 18 is rejected.

As per claim 41, claim 41 claims that "further comprising third spreading means", and in the claims where claim 41 depends from (claims 16 and 31) there are only a first spreading means discloses, so it is vague and indefinite to claims a third spreading means when only a first spreading means has been claimed previously.

As per claim 42, claim 42 is rejected because depends directly from claim 41 and claim 41 is rejected.

As per claim 44, claim 44 claims that "further comprising third spreading means", and in the claims where claim 44 depends from (claims 16, 31 and 43) there are only a first spreading means disclosed, so it is vague and indefinite to claims a third spreading means when only a first spreading means has been claimed previously.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-5, 8-14, 16-28, 30-37 and 45-55 are rejected under 35 U.S.C. 102(b) as being anticipated by Sato (JP 2000022656 A) (using Applicant Admitted Prior Art (AAPA) for inherency of the Serial-parallel and parallel-serial converter in OFDM system).

As per claim 1, Sato discloses a multi-carrier communication apparatus comprising receiving means for receiving a multi-carrier signal mapped to subcarriers with a first symbol string including a first symbol with the amplitude of at least one of the

in-phase component and quadrature component set to "0" (abstract, figures 2A, 2B and 7; paragraphs [0030]-[0041]); and demapping means for demapping said multi-carrier signal to reception data (figure 7 block 24; paragraphs [0084]-[0086]).

As per claim 2, Sato discloses claim 1, Sato also discloses that the demapping means demaps a multi-carrier signal mapped to subcarriers with a first symbol string including a first symbol to a second symbol string excluding said first symbol in predetermined symbol units and demodulates the demapped symbol pattern to obtain reception data (figure 7 block 24; paragraphs [0084]-[0086]).

As per claim 3, Sato discloses claim 1, Sato also discloses that the demapping means demodulates a multi-carrier signal mapped to subcarriers with a first symbol string including a first symbol and converts the demodulated first data expressed with three discrete values to second data expressed with two discrete values (figure 2A paragraphs [0030]-[0041]).

As per claim 4, Sato discloses claim 2, Sato also discloses that the demapping means comprises storing means for storing a table of correspondence between a first symbol string and a second symbol string and collating means for checking a received symbol string against said table (paragraphs [0011] and [0014]).

As per claim 5, Sato discloses claim 3, Sato also discloses that the demapping means comprises storing means for storing a table of correspondence between a second data pattern expressed with two discrete values and a first data pattern expressed with three discrete values (paragraphs [0011] and [0014], figure 2A paragraphs [0030]-[0041]).

As per claim 8, Sato discloses claim 1, Sato also discloses that the demapping means comprises amplitude measuring means for measuring the amplitude of a symbol mapped to each subcarrier and pattern deciding means for deciding said first symbol string based on the measured amplitude (abstract, figures 2A, 2B and 7; paragraphs [0030]-[0041]; and paragraphs [0084]-[0086]). The system has to discern if the amplitude is zero when the point is in the in-phase or quadrature ordinate or positive, negative).

As per claim 9, Sato discloses claim 1, Sato also discloses that the demapping means comprises first deciding means for deciding a subcarrier to which a first symbol is mapped according to the number of subcarriers to which the first symbol with amplitude "0" is mapped (abstract, figures 2A, 2B and 7; paragraphs [0030]-[0041]; and paragraphs [0084]-[0086]) and second deciding means for deciding symbols other than the symbol in said symbol string decided to be the first symbol through a polarity decision (abstract, figures 2A, 2B and 7; paragraphs [0030]-[0041]; and paragraphs [0084]-[0086]). The system has to discern if the amplitude is zero when the point is in the in-phase or quadrature ordinate or positive, negative).

As per claim 10, Sato discloses claim 1, Sato also discloses that the demapping means performs demapping by associating a plurality of first symbol strings with one data pattern in predetermined symbol units (paragraphs [0084]-[0086]).

As per claim 11, Sato discloses claim 1, Sato also discloses that the demapping means comprises combining means for combining a plurality of symbols as a combined symbol, first deciding means for deciding a symbol having the smallest amplitude value

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of said combined symbol as a first symbol (abstract, figures 2A, 2B and 7; paragraphs [0030]-[0041]; and paragraphs [0084]-[0086]). The system has to discern if the amplitude is zero when the point is in the in-phase or quadrature ordinate or positive, negative) and second deciding means for making a polarity decision on symbols other than said first symbol (paragraphs [0031] and [0084]-[0086]).

As per claim 12, Sato discloses claim 11, Sato also discloses that the combining means selects and combines a plurality of symbols (abstract, figures 2A, 2B and 7; paragraphs [0030]-[0041]; and paragraphs [0084]-[0086]).

As per claim 13, Sato discloses claim 11, Sato also discloses that the combining means combines a plurality of symbols with an equal gain (abstract, figures 2A, 2B and 7; paragraphs [0030]-[0041]; and paragraphs [0084]-[0086]).

As per claim 14, Sato discloses claim 11, Sato also discloses that the combining means combines a plurality of symbols with a maximum ratio (abstract, figures 2A, 2B and 7; paragraphs [0030]-[0041]; and paragraphs [0084]-[0086]).

As per claim 16, Sato discloses a multi-carrier communication apparatus comprising mapping means for mapping data to be sent to subcarriers with a first symbol string including a first symbol with the amplitude of at least one of the in-phase component and the quadrature component set to "0" (abstract, figures 2A, 2B and 4; paragraphs [0051] and [0069]); and transmitting means for transmitting mapped multi-carrier signals (figure 4 block 5; paragraphs [0026]-[0027])

As per claim 17, Sato discloses claim 16, Sato also discloses that the mapping means maps the second symbol string obtained by modulating data to be sent to

subcarriers with the first symbol string including the first symbol (abstract, figures 2A, 2B and 4; paragraphs [0051] and [0069]).

As per claim 18, Sato discloses claim 16, Sato also discloses that the mapping means converts second data expressed with two discrete values to be sent to first data expressed with three discrete values and modulates said first data to the first symbol string including the first symbol (figure 2A paragraphs [0030]-[0041]).

As per claim 19, Sato discloses claim 17, Sato also discloses that the mapping means comprises storing means for storing a table of correspondence between the first symbol string and second symbol string (paragraphs [0011] and [0014]).

As per claim 20, Sato discloses claim 18, Sato also discloses that the demapping means comprises storing means for storing a table of correspondence between a second data pattern expressed with two discrete values and a first data pattern expressed with three discrete values (paragraphs [0011] and [0014], figure 2A paragraphs [0030]-[0041]).

As per claim 21, Sato discloses claim 16, Sato also discloses that the mapping means fixes the number of subcarriers to which the first symbol is mapped (abstract, figures 2A, 2B and 4; paragraphs [0033] and [0038]-[0039] n subcarriers).

As per claim 22, Sato discloses claim 16, Sato also discloses notifying means for notifying the number of subcarriers to which the first symbol is mapped (paragraphs [0030]-[0041]).

As per claim 23, Sato discloses claim 16, Sato also discloses that the Euclidean distance between a first symbol string and another first symbol string mapped by the

mapping means is equal to or greater than a predetermined distance (figures 2A, 2B; paragraphs [0051] and [0069]).

As per claim 24, Sato discloses claim 16, Sato also discloses a first symbol string group and another first symbol string group mapped by the mapping means have different positions of subcarriers to which the first symbol is mapped (figures 2A, 2B b and c; paragraphs [0051] and [0069]).

As per claim 25, Sato discloses claim 16, Sato also discloses that the mapping means associates one data pattern with a plurality of first symbol strings and the transmitting means sends any one of said plurality of first symbol strings (figures 2A, 2B b; paragraphs [0051] and [0069]).

As per claim 26, Sato discloses claim 16, Sato also discloses that the Euclidean distance between a first symbol string corresponding to one data piece to be sent and another first symbol string corresponding to said data to be sent mapped by the mapping means is equal to or smaller than the Euclidean distance from the other first symbol string (figures 2A, 2B b and c; paragraphs [0051] and [0069]).

As per claim 27, Sato discloses claim 16, Sato also discloses that the mapping means places a first symbol on a subcarrier different from the one on which the first symbol was placed in the past in the first symbol string to be sent. (figures 2A, 2B f2 to fn; paragraphs [0051] and [0069]).

As per claim 28, Sato discloses claim 27, Sato also discloses that the mapping means comprises insertion position storing means for storing the position and timing of the first symbol in the first symbol string (paragraphs [0011] and [0014]).

As per claim 30, Sato discloses claim 16, Sato also discloses that the mapping means uses a set of a plurality of first symbols for the first symbol and maps from the data pattern to the first symbol string (abstract, figures 2A, 2B and 4; paragraphs [0051] and [0069]).

As per claim 31, Sato discloses claim 16, Sato also discloses a first spreading means for spreading a symbol string at a predetermined spreading rate (figure 4 block 13 and figure 5 paragraphs [0051] and [0059]).

As per claim 32, Sato discloses claim 31, Sato also discloses that the first spreading means spreads the first symbol string including the first symbol mapped by the mapping means at a predetermined spreading rate (figure 4 block 13 and figure 5 paragraphs [0051] and [0059]).

As per claim 33, Sato discloses claim 31, Sato also discloses that the first spreading means multiplies the second symbol string obtained by modulating data to be sent by a spreading code and the mapping means maps said second symbol string to subcarriers with the first symbol string including the first symbol (figure 4 block 13 and figure 5 paragraphs [0051] and [0059]).

As per claim 34, Sato discloses claim 32, Sato also discloses serial-parallel converting means for converting from serial to parallel the first symbol string including the first symbol spread at a predetermined spreading rate by the first spreading means (figure 4 block 12 the mapping inherently produces a serial to parallel process, this is also disclosed by AIPA figure 1 sections 13 and 14 and the AIPA JP07-143098 figure 1).

As per claim 35, Sato discloses claim 31, Sato also discloses serial-parallel converting means for converting a symbol string from serial to parallel, wherein the first spreading means spreads said symbol string converted from serial to parallel at a predetermined spreading rate (figure 4 block 12 the mapping inherently produces a serial to parallel process, this is also disclosed by AAPA figure 1 sections 13 and 14 and the AAPA JP07-143098 figure 1).

As per claim 36, Sato discloses claim 35, Sato also discloses that the serial-parallel converting means converts from serial to parallel the first symbol string including the first symbol mapped by the mapping means (figure 4 block 12 the mapping inherently produces a serial to parallel process, this is also disclosed by AAPA figure 1 sections 13 and 14 and the AAPA JP07-143098 figure 1).

As per claim 37, Sato discloses claim 35, Sato also discloses that the mapping means maps the symbol string spread by the first spreading means (figure 4 block 12; paragraphs [0051] and [0059]).

As per claim 45, Sato discloses receiving means for receiving a multi-carrier signal mapped to subcarriers with a first symbol string including a first symbol with the amplitude of at least one of the in-phase component and quadrature component of the communication terminal apparatus set to "0" (abstract, figures 2A, 2B and 7; paragraphs [0030]-[0041]); and demapping means for demapping said multi-carrier signal to reception data (figure 7 block 24; paragraphs [0084]-[0086]).

As per claim 46, Sato discloses receiving means for receiving a multi-carrier signal mapped to subcarriers with a first symbol string including a first symbol with the

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amplitude of at least one of the in-phase component and quadrature component of the communication terminal apparatus set to "0" (abstract, figures 2A, 2B and 7; paragraphs [0030]-[0041]); and demapping means for demapping said multi-carrier signal to reception data (figure 7 block 24; paragraphs [0084]-[0086]).

As per claim 47, Sato discloses mapping means for mapping data to be sent to subcarriers with a first symbol string including a first symbol with the amplitude of at least one of the in-phase component and quadrature component set to "0" (abstract, figures 2A, 2B and 4; paragraphs [0051] and [0069]); and transmitting means for transmitting the mapped multi-carrier signal (figure 4 block 5; paragraphs [0026]-[0027]).

As per claim 48, Sato discloses mapping means for mapping data to be sent to subcarriers with a first symbol string including a first symbol with the amplitude of at least one of the in-phase component and quadrature component set to "0" (abstract, figures 2A, 2B and 4; paragraphs [0051] and [0069]); and transmitting means for transmitting the mapped multi-carrier signal (figure 4 block 5; paragraphs [0026]-[0027]).

As per claim 49, Sato discloses a peak power suppression method with the transmitter side comprising a mapping step of mapping data to be sent to subcarriers with a first symbol string including a first symbol (abstract, figures 2A, 2B and 4; paragraphs [0051] and [0069]); and a transmitting step of transmitting the mapped multi-carrier signal (figure 4 block 5; paragraphs [0026]-[0027]), and the receiver side comprising a receiving step of receiving the multi-carrier signal mapped to a subcarrier with the first symbol string including said first symbol (abstract, figures 2A, 2B and 7;

paragraphs [0030]-[0041]); and a demapping step of demapping said multi-carrier signal to reception data (figure 7 block 24; paragraphs [0084]-[0086]).

As per claim 50, Sato discloses claim 49, Sato also discloses that the second symbol string obtained by modulating data to be sent is mapped to subcarriers with the first symbol string including the first symbol (abstract, figures 2A, 2B and 4; paragraphs [0051] and [0069]).

As per claim 51, Sato discloses claim 49, Sato also discloses that the demapping means demodulates a multi-carrier signal mapped to subcarriers with a first symbol string including a first symbol and converts the demodulated first data expressed with three discrete values to second data expressed with two discrete values (figure 2A paragraphs [0030]-[0041]).

As per claim 52, Sato discloses claim 49, Sato also discloses that in the demapping step, a multi-carrier signal mapped to subcarriers with the first symbol string including the first symbol is demapped to a second symbol string excluding said first symbol in predetermined symbol units and the demapped symbol pattern is demodulated to obtain reception data (figure 7 block 24; paragraphs [0084]-[0086]).

As per claim 53, Sato discloses claim 49, Sato also discloses that the demapping means demodulates a multi-carrier signal mapped to subcarriers with a first symbol string including a first symbol and converts the demodulated first data expressed with three discrete values to second data expressed with two discrete values (figure 2A paragraphs [0030]-[0041]; figure 7 block 24; paragraphs [0084]-[0086]).

As per claim 54, Sato discloses claim 49, Sato also discloses that the demapping step includes an amplitude measuring step of measuring the amplitude of a symbol mapped to each subcarrier and a pattern deciding step of deciding said first symbol string based on the measured amplitude (abstract, figures 2A, 2B and 7; paragraphs [0030]-[0041]; and paragraphs [0084]-[0086]. The system has to discern if the amplitude is zero when the point is in the in-phase or quadrature ordinate or positive, negative).

As per claim 55, Sato discloses claim 49, Sato also discloses a notifying step of notifying the number of subcarriers to which a first symbol with amplitude "0" is mapped (paragraphs [0030]-[0041]), and the demapping step on the receiver side further comprising a first deciding step of deciding a subcarrier to which said first symbol is mapped according to the number of subcarriers to which the first symbol with amplitude "0" is mapped (abstract, figures 2A, 2B and 7; paragraphs [0030]-[0041]; and paragraphs [0084]-[0086]); and a second deciding step of deciding polarity about symbols other than said first symbol (abstract, figures 2A, 2B and 7; paragraphs [0030]-[0041]; and paragraphs [0084]-[0086]. The system has to discern if the amplitude is zero when the point is in the in-phase or quadrature ordinate or positive, negative).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 6, 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato as applied to claim 4 above, and further in view of O'Sullivan (US 5487069 A).

As per claim 6, Sato discloses claim 4, Sato doesn't disclose retransmission requesting means for requesting the transmitting side for retransmission when the received symbol string cannot be associated with any patterns in the table. O'Sullivan discloses retransmission requesting means for requesting the transmitting side for retransmission when the received symbol string cannot be associated with any patterns in the table (column 8 lines 27-36; and column 10 lines 35-46). Sato and O'Sullivan are analogous art because they are from the same field of endeavor of multicarrier communications. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the system disclosed by Sato the retransmission technique disclosed by O'Sullivan. The suggestion/motivation for doing so would have been to improve the transmission performance (O'Sullivan column 10 lines 35-46).

As per claim 7, Sato discloses claim 4, Sato doesn't disclose error correcting means for correcting errors of a received symbol string when said symbol string cannot be associated with any patterns in the table. O'Sullivan discloses error correcting means for correcting errors of a received symbol string when said symbol string cannot be associated with any patterns in the table (column 6 lines 54-67). Sato and O'Sullivan are analogous art because they are from the same field of endeavor of multicarrier communications. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the system disclosed by Sato the retransmission

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technique disclosed by O'Sullivan. The suggestion/motivation for doing so would have been to improve the transmission performance (O'Sullivan column 10 lines 35-46).

Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato as applied to claim 27 above, and further in view of Garcia (US 6785258 B1). As per claim 29, Sato discloses claim 27, Sato doesn't disclose a random number generating means for determining the position and timing of the first symbol in the first symbol string according to random numbers. Garcia discloses a random number generating means for determining the position and timing of the first symbol in the first symbol string according to random numbers (abstract figure 1 block 16, column 4 lines 43-56). Sato and Garcia are analogous art because they are from the same field of endeavor of multicarrier communications. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the system disclosed by Sato the randomization technique disclosed by Garcia. The suggestion/motivation for doing so would have been to reduce the peak power of the signal (Garcia abstract).

Claims 38, 39, 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato as applied to claims 31 and 35 above, and further in view of Sumiya (US 5319672 A).

As per claim 38, Sato discloses claim 35, Sato doesn't disclose second spreading means for spreading the first symbol string including the first symbol mapped by the mapping means at a predetermined spreading code, wherein the serial-parallel converting means performs serial-parallel conversion on the first symbol string multiplied by said spreading code by the second spreading means. Sumiya discloses

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second spreading means for spreading the first symbol string including the first symbol mapped by the mapping means at a predetermined spreading code, wherein the serial-parallel converting means performs serial-parallel conversion on the first symbol string multiplied by said spreading code by the second spreading means (figure 6A and 7 column 7 lines 7-26). Sato and Sumiya are analogous art because they are from the same field of endeavor of multicarrier communications. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the system disclosed by Sato the transmission technique disclosed by Sumiya. The suggestion/motivation for doing so would have been to communicate with a plurality the receivers at the same time (Sumiya abstract).

As per claim 39, Sato discloses claim 35, Sato doesn't disclose second spreading means for spreading the second symbol string at a predetermined spreading rate, wherein the serial-parallel converting mans performs serial-parallel conversion on the second symbol string multiplied by said spreading code by the second spreading means and the mapping means performs mapping processing on the signal spread by the first spreading means. Sumiya discloses second spreading means for spreading the second symbol string at a predetermined spreading rate, wherein the serial-parallel converting mans performs serial-parallel conversion on the second symbol string multiplied by said spreading code by the second spreading means and the mapping means performs mapping processing on the signal spread by the first spreading means (figure 5A block 3₂ column 6 lines 50-60). Sato and Sumiya are analogous art because they are from the same field of endeavor of multicarrier communications. At the time of

the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the system disclosed by Sato the transmission technique disclosed by Sumiya. The suggestion/motivation for doing so would have been to communicate with a plurality the receivers at the same time (Sumiya abstract).

As per claim 41, Sato discloses claim 31, Sato doesn't disclose third spreading means for spreading the signal spread by the first spreading means using spreading codes which differ from one communication apparatus to another at a predetermined spreading rate. Sumiya discloses third spreading means for spreading the signal spread by the first spreading means using spreading codes which differ from one communication apparatus to another at a predetermined spreading rate (figure 5A block 3₃ column 6 lines 50-60). Sato and Sumiya are analogous art because they are from the same field of endeavor of multicarrier communications. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the system disclosed by Sato the transmission technique disclosed by Sumiya. The suggestion/motivation for doing so would have been to communicate with a plurality the receivers at the same time (Sumiya abstract).

Claims 40 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato and Sumiya as applied to claim 38 above, and further in view of Kaiser (US 6188717 B1).

As per claim 40, Sato and Sumiya disclose claim 38, Sato and Sumiya don't disclose two-dimensional interleave means for performing chip-by-chip rearrangement on a spread signal in order of subcarriers and in order of transmission times. Kaiser

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discloses two-dimensional interleave means for performing chip-by-chip rearrangement on a spread signal in order of subcarriers and in order of transmission times (figure 2 block 5, column 5 line 58 to column 6 line 10). Sato, Sumiya and Kaiser are analogous art because they are from the same field of endeavor of multicarrier communications. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the system disclosed by Sato and Sumiya the interleaver disclosed by Kaiser. The suggestion/motivation for doing so would have been to avoid large error bursts through time selective fading and frequency-selective fading (Kaiser column 5 lines 58-65).

As per claim 42, Sato and Sumiya disclose claim 41, Sato and Sumiya don't disclose interleaving means for performing chip-by-chip rearrangement on the signal spread by the third spreading means. Kaiser discloses interleaving means for performing chip-by-chip rearrangement on the signal spread by the third spreading means (figure 2 block 5, column 5 line 58 to column 6 line 10). Sato, Sumiya and Kaiser are analogous art because they are from the same field of endeavor of multicarrier communications. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the system disclosed by Sato and Sumiya the interleaver disclosed by Kaiser. The suggestion/motivation for doing so would have been to avoid large error bursts through time selective fading and frequency-selective fading (Kaiser column 5 lines 58-65).

Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato as applied to claim 31 above, and further in view of Kaiser (US 6188717 B1).

As per claim 43, Sato discloses claim 31, Sato doesn't disclose interleaving means for performing chip-by-chip rearrangement on the signal spread by the first spreading means. Kaiser discloses interleaving means for performing chip-by-chip rearrangement on the signal spread by the first spreading means (figure 2 block 5, column 5 line 58 to column 6 line 10). Sato and Kaiser are analogous art because they are from the same field of endeavor of multicarrier communications. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the system disclosed by Sato the interleaver disclosed by Kaiser. The suggestion/motivation for doing so would have been to avoid large error bursts (Kaiser column 5 lines 58-65).

Claims 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato and Kaiser as applied to claims 43 above, and further in view of Sumiya (US 5319672 A). As per claim 44, Sato and Kaiser disclose claim 43, Sato and Kaiser don't disclose third spreading means for spreading the signal rearranged chip by chip by the interleaving means using codes which differ from one communication apparatus to another at a predetermined spreading rate. Sumiya discloses third spreading means for spreading the signal rearranged chip by chip by the interleaving means using codes which differ from one communication apparatus to another at a predetermined spreading rate (figure 5A block 3₃ column 6 lines 50-60). Sato, Kaiser and Sumiya are analogous art because they are from the same field of endeavor of multicarrier communications. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to incorporate in the system disclosed by Sato and Kaiser the

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transmission technique disclosed by Sumiya. The suggestion/motivation for doing so would have been to communicate with a plurality the receivers at the same time (Sumiya abstract).

Allowable Subject Matter

Claims 15 and 56 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hadad (US 6985432 B1) discloses improvements in channel performance using signal processing of pilot signals in the channel.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is (571) 272-3119. The examiner can normally be reached on Monday-Friday 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Juan Alberto Torres
12-12-2006


12/12/06
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